

REPORT ON  
**GEOTECHNICAL INVESTIGATIONS**  
FOR THE PROPOSED  
**Government Higher Secondary School**  
**At**  
**Block- Sahibganj, Dist. Muzaffarpur**

Your Letter No.- BSEIDC/Tech/1960 (P)/2018-7919 Dated – 22.11.2021  
[SL. No. – 2]

Submitted to  
The Chief Engineer  
BSEIDC, Patna

December, 2021



**BIHAR FOUNDATION CONSULTANTS**

[A unit of Baidyanath Foundation Consultants Pvt. Ltd.]

Having an

**NABL Accredited / ISO 9001: 2015 Certified Laboratory**

Ganga Darshan Apartment, Flat No. 403.

**Patna – 10**

[e-mail : bifcon.pat@gmail.com, Phone No: + 91612 – 2272826]

**Government Higher Secondary School at  
Block- Sahibganj, Dist. Muzaffarpur**



Bihar Foundation Consultants  
403, Ganga Darshan Apartment, Patna-10  
[A Unit : Baidyanath Foundation Consultants Pvt. Ltd.]

**PN - 211209**

## CONTENTS

<u>Sl.No.</u>	<u>Description</u>	<u>Page No.</u>
1	Introduction	1
2	Field Work	1
3	Laboratory Test	2
4	Presentation of Test Results	2
5	Soil Stratification	2
6	Foundation Analysis	2
7	Recommendations	3-4

### Appendix

[ Containing Figures and Tables ]

- A. Bore Holes Location Map
- B. Field Test Observations & Laboratory Test Results
- C. Graph of Grain size Analysis
- D. Triaxial shear / Direct shear strength test curves
- E. 'e-log p' Curves from Consolidation Tests
- F. Sample calculation of pile / bearing capacity
- G. Copy of Work Order

## **1. INTRODUCTION**

The subsoil investigations reported herein were taken up (vide W.O. No. [BSEIDC/Tech/1960\(P\)/2018-7919 Dated – 22.11.2020 \[SL. No. 2\]](#) to find out the nature of subsoil at the site of the proposed construction and to recommend the capacity and type of its foundation. After certain tests on the soil, as detailed below, the desired recommendations have been made on **page 3-4** of this Report.

## **2. FIELD WORK**

The fieldwork could not be started in June 2020 as the site was waterlogged. This was reported by us to the clients, who asked us to wait for further orders. We were telephonically informed by them in Nov. 2021 to start the work at a new site selected by them. We did accordingly.

The fieldwork consisted of sinking bore holes, collecting soil samples and conducting the necessary field tests.

### **2.1. Boring**

Taking guidance from IS: 1892, 150 mm diameter bore holes were sunk at locations shown in the bore hole location map.

### **2.2 Sampling**

#### **2.2.1 Undisturbed Soil Samples**

Open drive samplers of 100-mm diameter and about 450-mm length were used for obtaining undisturbed samples of cohesive soils. The collection, sealing, labeling and transportation of the samples to the laboratory were done as per the IS guide-lines.

#### **2.2.2 Disturbed Soil Samples**

Disturbed soil samples were collected at suitable intervals of depth (not more than 2.5 m) and at all depths of change in the nature of the subsoil. These samples were sealed in polythene bags with proper identification labels.

### **2.3 Field Tests**

#### **2.3.1 Standard Penetration Tests (SPT)**

These tests were conducted as per IS: 2131 – 1963. The depth interval between two consecutive tests was 1 to 1.5 m. The tests were located in between the levels at which undisturbed soil samples were collected.

### **3. LABORATORY TESTS**

Some or all of the following laboratory tests, as necessary, were done on the collected soil samples. Representative soil samples were selected for this from the different soil strata encountered during boring. The tests were performed as per the relevant Indian Standard Codes of Practice.

- (a) Natural moisture content
- (b) Bulk density
- (c) Grain size analysis (using sieves and / or hydrometer)
- (d) Specific gravity of soil solids
- (e) Atterberg's limit tests (liquid, plastic and shrinkage limits)
- (f) Shear Tests :
  - [I] Triaxial compression test (unconsolidated – undrained), generally for fine- grained soils
  - [II] Unconfined compression tests, only on cohesive soils
  - [III] Direct shear tests, generally for coarse-grained soils
- (g) Other tests as and when required.

### **4. PRESENTATION OF TEST RESULTS**

The field and laboratory test are given in the **Appendix B**.

### **5. SOIL STRATIFICATION**

The results of field tests in three bore holes sunk at the site [vide Location Sketch in App. A] and the results of laboratory tests conducted on the collected soil samples indicate that the soil stratification at the site is as describe below.

The sub soil in all 3 BH's is silty clay [type CL] up to the investigated depth of 10.5 m bgl.

*Ground water table was struck at about 2.30 m to 2.40 m depth below GL in December, 2021. It is subject to seasonal variations.*

### **6. FOUNDATION ANALYSIS**

The safe capacity of foundation of any type and size may be determined on the basis of the soil data given in this Report by using the standard methods of foundation design and following the relevant Indian Standard Codes.

Report on Sub Soil Investigations for the Proposed  
**Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur**

**7. RECOMMENDATIONS**

The design of the foundation for the proposed structure depends on the nature of both [a] the subsoil and [b] the structure.

The sub soil in all 3 BH's is silty clay [type CL] up to the investigated depth of 10.5 m bgl.

*Ground water table was struck at about 2.30 m to 2.40 m depth below GL in December, 2021. It is subject to seasonal variations.*

Considering the above facts,

1. The proposed structure may be provided with shallow foundation at a depth of 1.5 m or more.
2. Alternatively, U/R piles of lengths 4.0 m to 10.0 m may be used with stem diameters of 0.25 m, 0.30 m, 0.40 m and 0.50\* m and bulb diameters equal to 2 times the stem diameter.

**\*However 0.5 m stem diameter shall be used for U/R piles of lengths 6 m or more**

By way of example, the values of safe capacities of

- (1) Shallow foundations and (2) Single or double bulbed u/r piles of the above mentioned sizes and depths have been calculated (vide Samples of Calculations in Appendix F) and are tabulated below.

**Table 1: Allowable Net Bearing Pressures [  $q_{na}$  ] and Settlements Expected [s]**

Depth (m)	Width (m)	Net allowable bearing pressure (t/m <sup>2</sup> ) for			Maximum expected settlement (mm)
		Strip footing	Square footing	Raft footing	
1.5	2.0	6.0	7.1	...	75
	3.0	5.0	6.8	...	75
	10.0	...	...	6.5	100
2.0	2.0	7.1	8.5	...	75
	3.0	5.7	8.0	...	75
	10.0	...	...	7.4	100
2.5	2.0	8.4	10.0	...	75
	3.0	6.5	9.4	...	75
	10.0	...	...	7.9	100
3.0	2.0	10.1	12.1	...	75
	3.0	7.4	11.2	...	75
	10.0	...	...	8.5	100
3.5	2.0	12.4	14.8	...	75
	3.0	8.1	13.6	...	75
	10.0	...	...	9.0	100
4.0	2.0	13.9	17.8	...	75
	3.0	8.9	15.6	...	75
	10.0	...	...	9.4	100
4.5	2.0	15.3	20.0	...	75
	3.0	9.7	17.0	...	75
	10.0	...	...	9.9	100

**Table 2. Safe Capacities of U/R Piles [Factor of safety = 2.5]  
 [Bulb diameter = 2.0 times the shaft diameter]**

Pile length below pile Cap (m)	<b>Safe Pile Capacity [tonnes]</b> <i>(SUBJECT TO CHECKING FOR SLENDERNESS RATIO*)</i>							
	<b>Stem diameter (m)</b>							
	<b>0.25</b>		<b>0.30</b>		<b>0.40</b>		<b>0.50</b>	
	One bulb	Two bulbs	One bulb	Two bulbs	One bulb	Two bulbs	One bulb	Two bulbs
4.0	4.6	5.6	6.2	7.8	10.4	13.1		
6.0	7.2	8.9	9.7	12.1	15.6	20.0	23.0	29.7
8.0	10.7	12.7	14.1	16.9	22.2	27.2	32.0	39.8
10.0	13.7	16.1	17.9	21.3	27.7	33.8	39.5	49.0

\*For a preliminary checking of the slenderness ratio, the modulus of subgrade reaction (k) may be estimated from the following empirical relation given in IS: 2950-1981 (Second Revision) Table 1.  
 $k \text{ (kN/m}^3\text{)} = 240 c$ , where  $c \text{ (kN/m}^2\text{)}$  is the value of cohesion of the soil at the concerned depth.

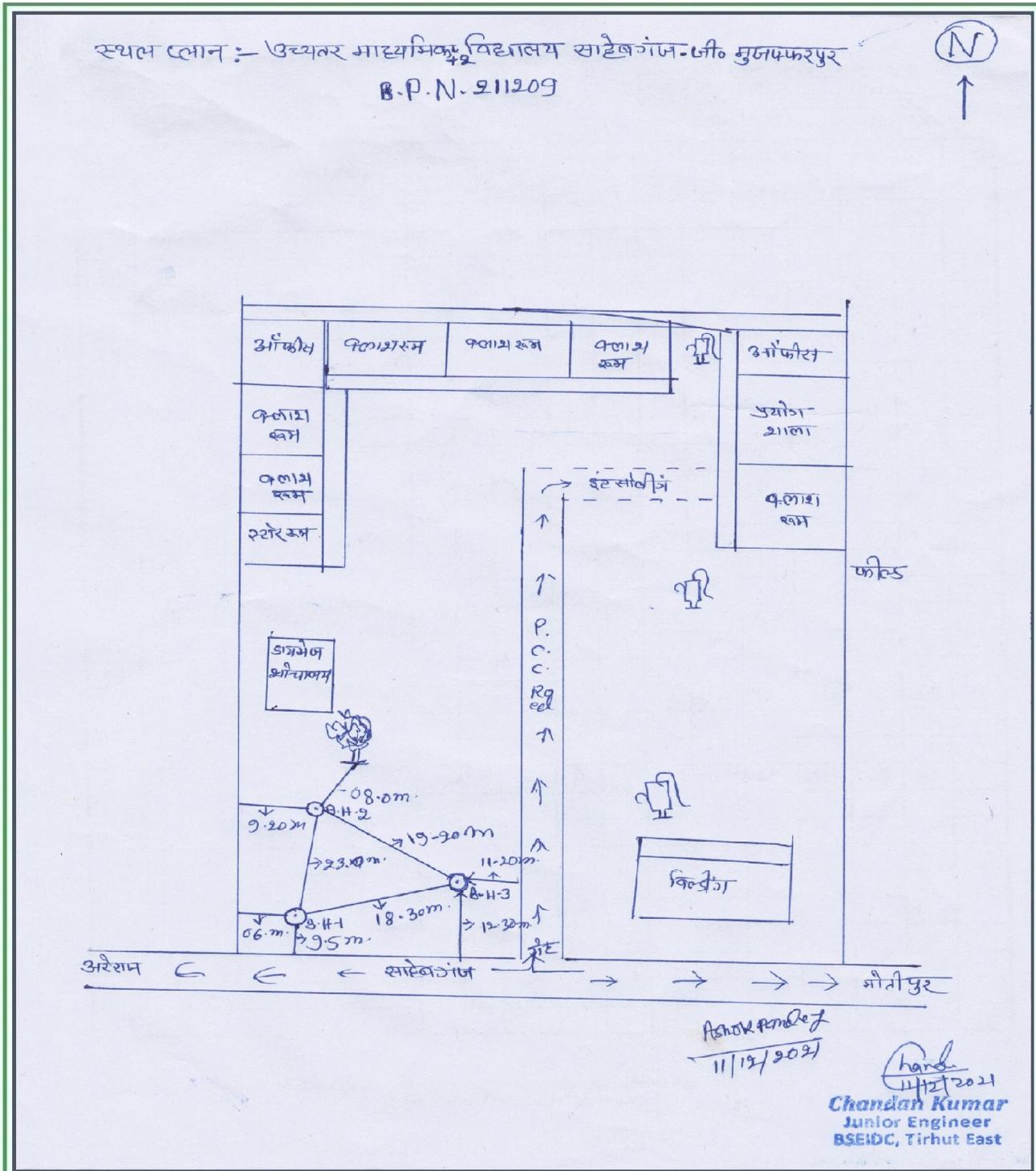
**Notes :**

1. If a subsoil condition much different from those reported herein is met with during foundation trenching or piling, suitable steps should be taken.
2. If concreting of piles is to be done below water table, DMC and tremie method should be adopted.
3. If u/r piles are provided, care should be taken to ensure proper formation of bulbs.
4. Shallow foundations or pile caps should be isolated from the surrounding expansive soil by layers of compacted local sand.
5. As per the provisions of the IS Code, **an appropriate number of piles must be subjected to routine load tests to check the veracity of the above recommended values of the safe capacities of piles.**

For Bihar Foundation Consultants

(Prof. C.N. Sinha, Dr.-Ing., FIE)  
 Chief Consultant.

# Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur



Bihar Foundation Consultants  
403, Ganga Darshan Apartment, Patna-10  
[A Unit : Baidyanath Foundation Consultants Pvt. Ltd.]

**PN - 211209**

**Appendix - A**

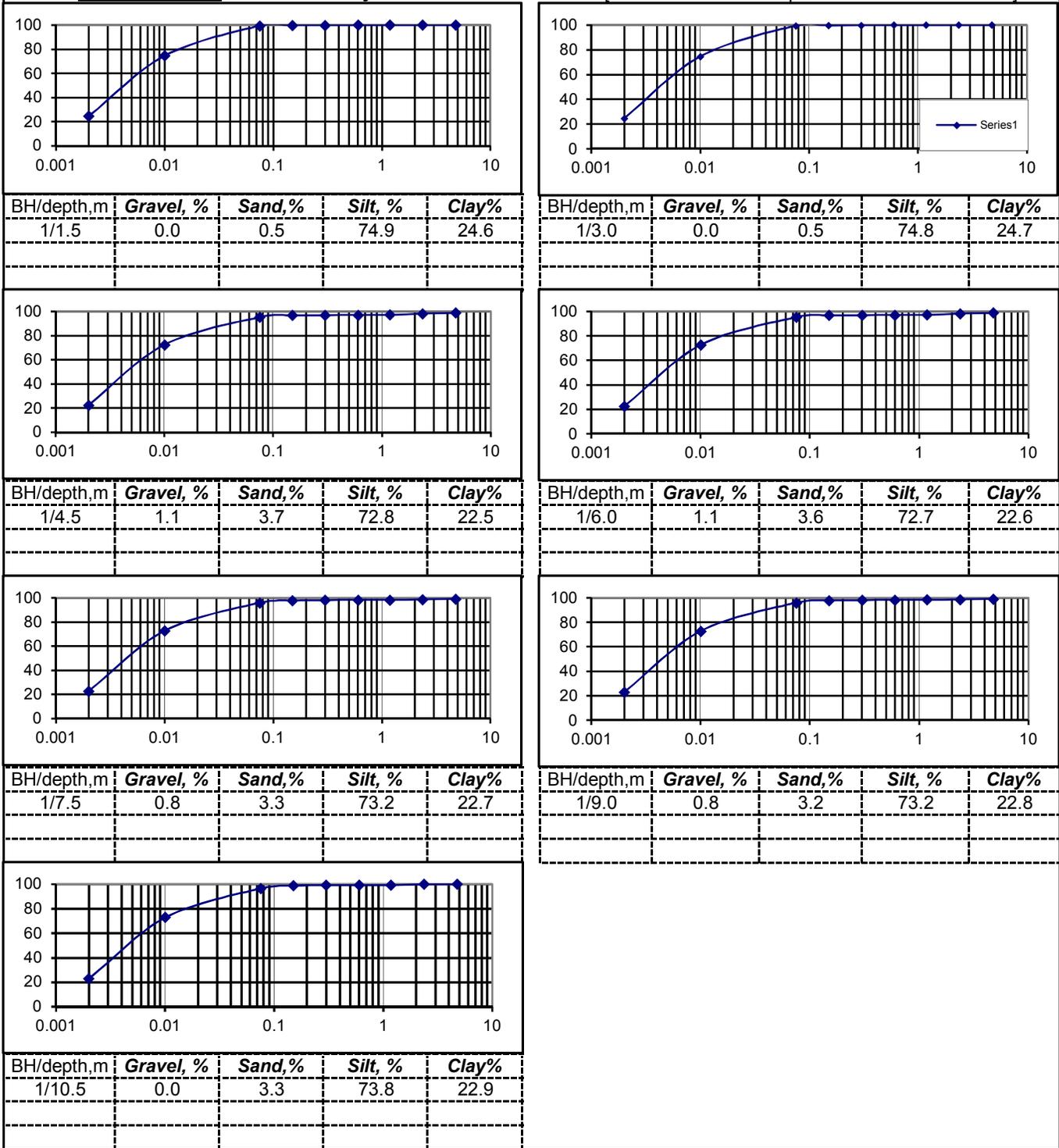
NAME OF WORK : Sub soil Investigation for C/O						BORING FINISH DATE : 10.12.2021		WATER TABLE : 2.30 m bgl											
<b>Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur</b>						BORING METHOD : Rotary													
BORE HOLE NO. : 1		Site Incharge - Ashok Pandey				TERMINATION DEPTH : 10.5 m		RECORD ON : 10.12.2021											
Depth Below GL (m)	Sample No.	SPT 'N' Value observation	Visual Description of Soil with IS Classification	Depth(m)		Thickness (m)	Liquid Limit	Plastic Limit	Plasticity Indx, %	Bulk Density (gm/cm3)	Natural Moisture Content (%)	Specific Gravity	Shear Test			Compression Index (C <sub>c</sub> )			
		Obsr.		from	to								Type of Test	Cohesion, c (kg/cm2)	Friction Angle, φ°				
1.0			Greyish silty clay, CL	0.0		6.0													
1.5	S1	6						32.1	23.0	9.1	1.96	28.6	2.70		0.30	3.6			
2.5																			
3.0	S2	10									2.00	26.0	2.70		0.48	5.0			
4.0																			
4.5	S3	13						29.9	22.2	7.7	2.01	25.4	2.70		0.59	5.1	0.137		
5.5																			
6.0	S4	16			6.0						2.02	24.7	2.70		0.65	5.1			
7.0			Blakish silty clay, CL	6.0		4.5													
7.5	S5	21						31.6	22.2	9.4	2.03	24.3	2.70		0.75	5.2			
8.5																			
9.0	S6	23									2.03	24.2	2.70		0.79	5.3			
10.0																			
10.5	S7	30			10.5						2.05	22.9	2.70		0.93	5.3			

NAME OF WORK : Sub soil Investigation for C/O						BORING FINISH DATE : 10.12.2021		WATER TABLE : 2.30 m bgl											
<b>Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur</b>						BORING METHOD : Rotary													
BORE HOLE NO. : 2		Site Incharge - Ashok Pandey				TERMINATION DEPTH : 10.5 m		RECORD ON : 10.12.2021											
Depth Below GL (m)	Sample No.	SPT 'N' Value observation	Visual Description of Soil with IS Classification	Depth(m)		Thickness (m)	Liquid Limit	Plastic Limit	Plasticity Indx, %	Bulk Density (gm/cm3)	Natural Moisture Content (%)	Specific Gravity	Shear Test			Compression Index (C <sub>c</sub> )			
		Obsr.		from	to								Type of Test	Cohesion, c (kg/cm <sup>2</sup> )	Friction Angle, φ°				
1.0			Greyish silty clay, CL	0.0		6.0													
1.5	S1	5									1.95	29.3	2.70		0.25	3.0			
2.5																			
3.0	S2	7						32.8	23.0	9.8	1.97	28.0	2.70		0.35	4.1	0.151		
4.0																			
4.5	S3	11									2.01	25.4	2.70		0.51	5.1	0.139		
5.5																			
6.0	S4	14			6.0			32.5	22.9	9.6	2.01	25.3	2.70		0.61	5.1			
7.0			Blakish silty clay, CL	6.0		4.5													
7.5	S5	21									2.03	24.3	2.70		0.75	5.2			
8.5																			
9.0	S6	22						36.4	23.3	13.1	2.03	24.2	2.70		0.77	5.2			
10.0																			
10.5	S7	29			10.5						2.04	23.4	2.69		0.91	5.3			

NAME OF WORK : Sub soil Investigation for C/O						BORING FINISH DATE : 11.12.2021		WATER TABLE : 2.40 m bgl											
<b>Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur</b>						BORING METHOD : Rotary													
BORE HOLE NO. : 3		Site Incharge - Ashok Pandey				TERMINATION DEPTH : 10.5 m		RECORD ON : 11.12.2021											
Depth Below GL (m)	Sample No.	SPT 'N' Value observation	Visual Description of Soil with IS Classification	Depth(m)		Thickness (m)	Liquid Limit	Plastic Limit	Plasticity Indx,%	Bulk Density (gm/cm3)	Natural Moisture Content (%)	Specific Gravity	Shear Test			Compression Index (C <sub>c</sub> )			
		Obsr.		from	to								Type of Test	Cohesion, c (kg/cm <sup>2</sup> )	Friction Angle, φ°				
1.0			Greyish silty clay, CL	0.0		7.5													
1.5	S1	7						29.8	21.6	8.2	1.97	28.0	2.70		0.35	4.1			
2.5																			
3.0	S2	11									2.01	25.4	2.70		0.51	5.1			
4.0																			
4.5	S3	14						30.3	22.3	8.0	2.01	25.3	2.70		0.61	5.1	0.135		
5.5																			
6.0	S4	20									2.02	24.6	2.69		0.73	5.2			
7.0																			
7.5	S5	23			7.5						2.03	24.2	2.70		0.79	5.3			
8.5			Blakish silty clay, CL	7.5		3.0													
9.0	S6	27									2.04	23.5	2.70		0.87	5.3			
10.0																			
10.5	S7	31			10.5			33.4	22.7	10.7	2.05	22.8	2.70		0.95	5.3			

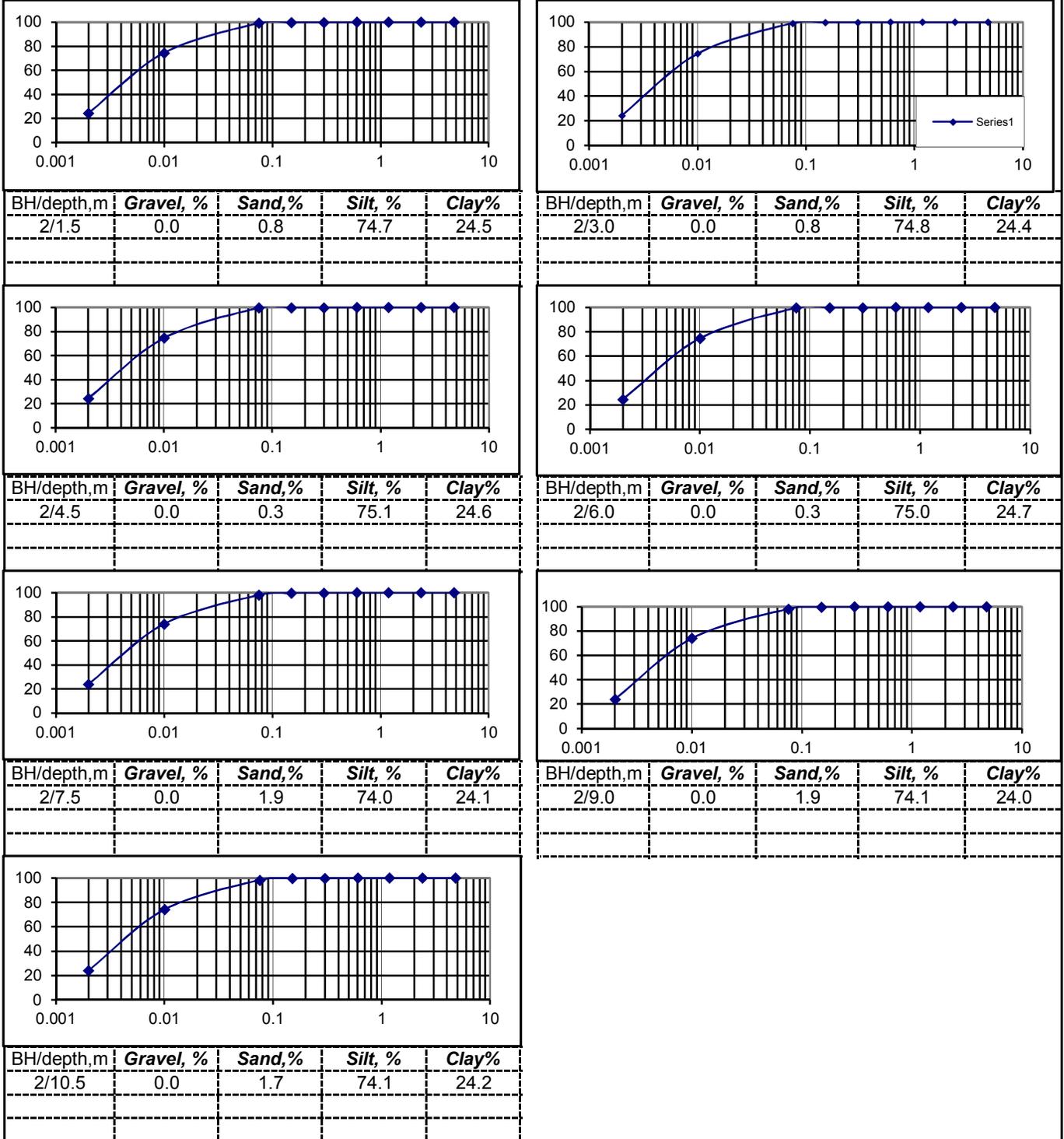
**Table 2 [part B]: Grain Size Analysis Results**

[ for Bore hole No./ Depth in m shown thus: 1/1.5 ]



**Table 2 [part B]: Grain Size Analysis Results**

[ for Bore hole No./ Depth in m shown thus: 1/1.5 ]



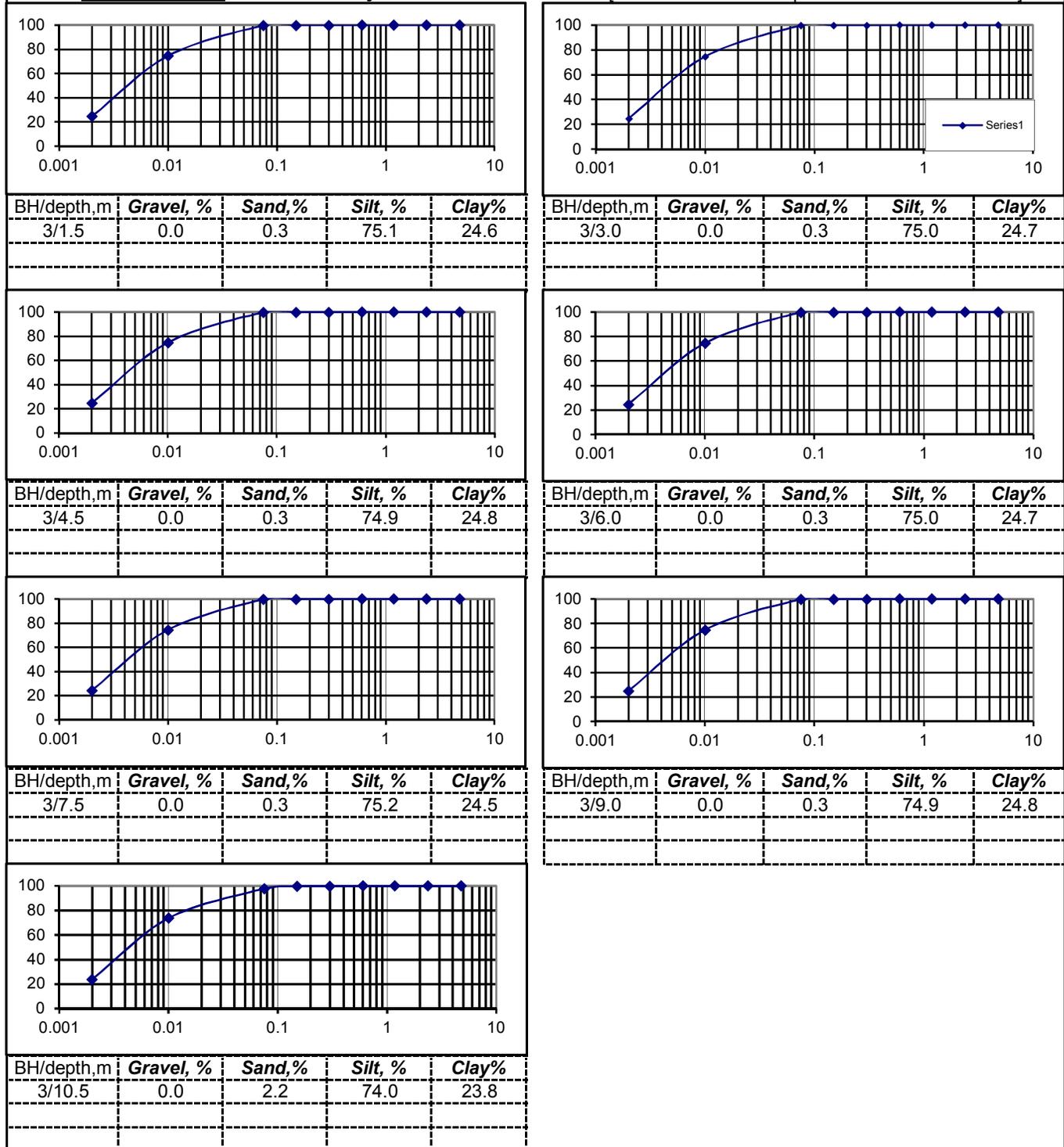
Bihar Foundation Consultants

403, Ganga Darshan Apartment, Patna-10

[A Unit : Baidyanath Foundation Consultants Pvt. Ltd.,]

**Table 2 [part B]: Grain Size Analysis Results**

[ for Bore hole No./ Depth in m shown thus: 1/1.5 ]

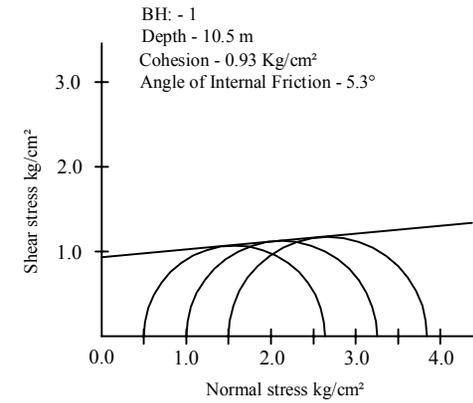
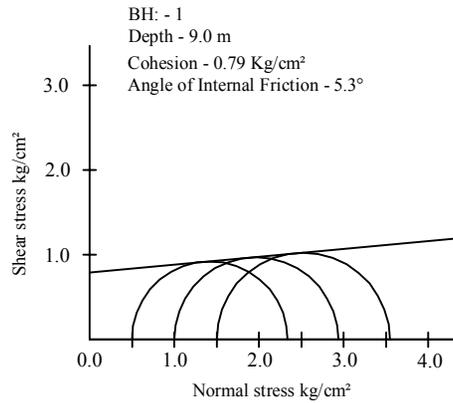
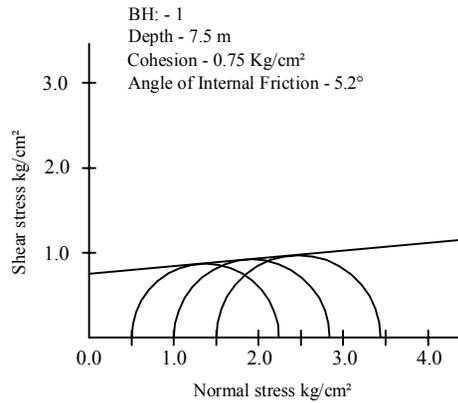
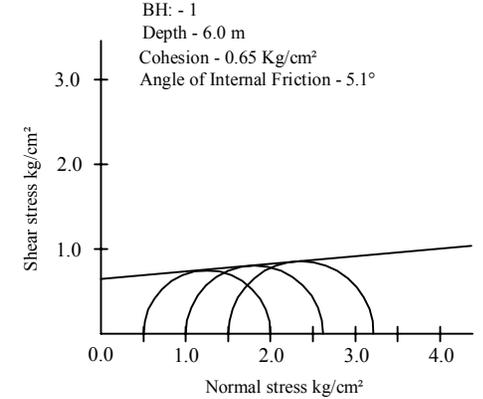
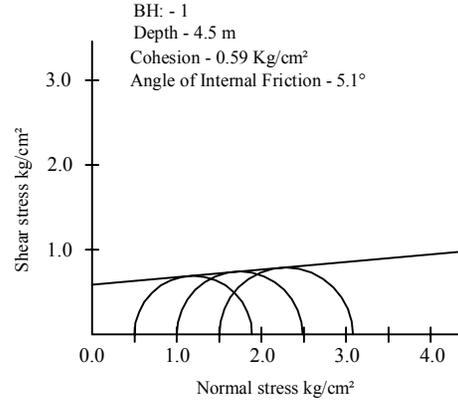
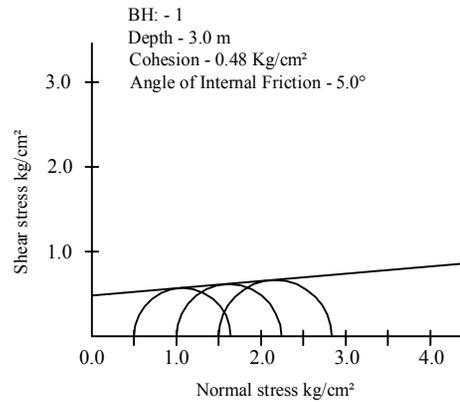
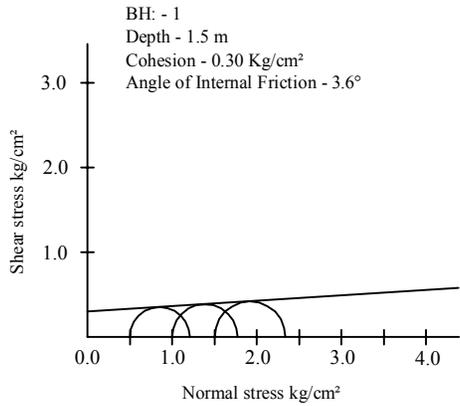


Bihar Foundation Consultants

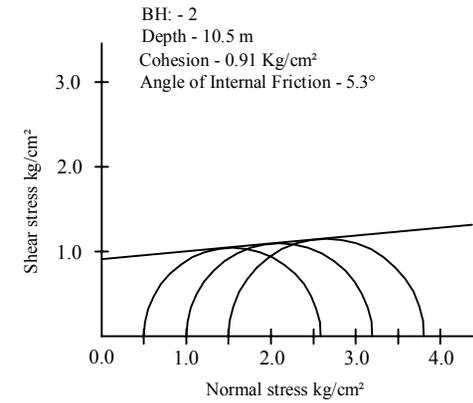
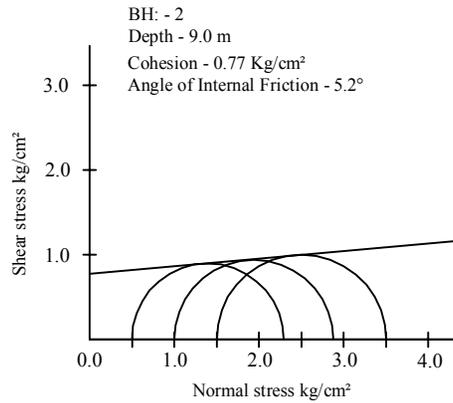
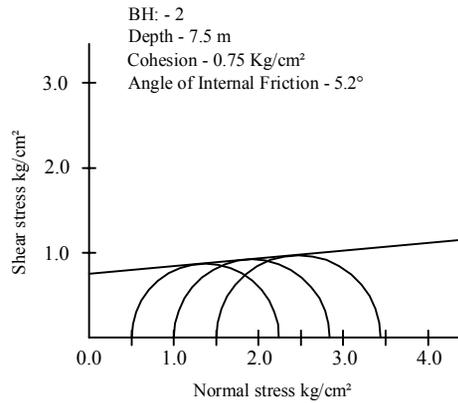
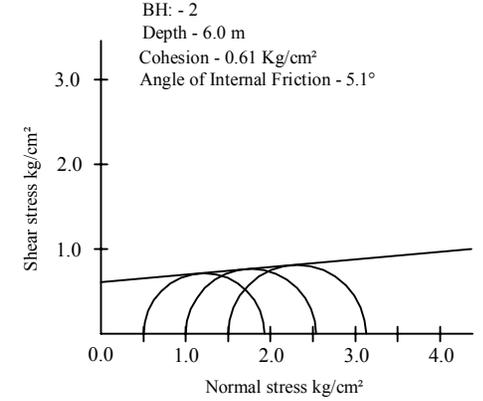
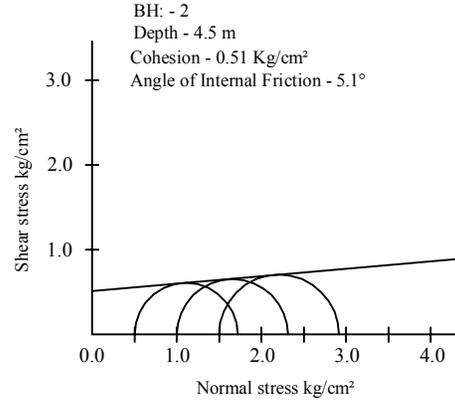
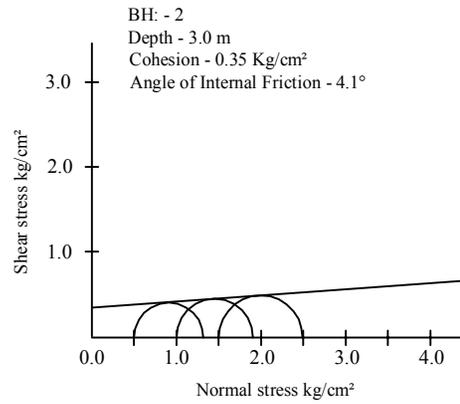
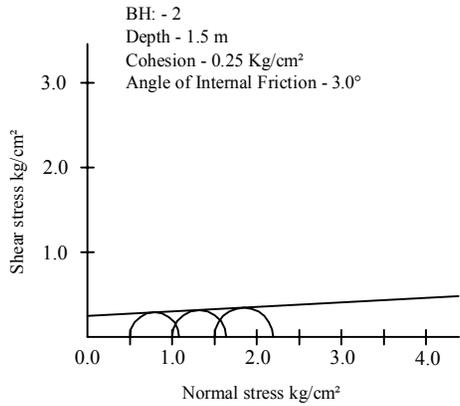
403, Ganga Darshan Apartment, Patna-10

[A Unit : Baidyanath Foundation Consultants Pvt. Ltd.,]

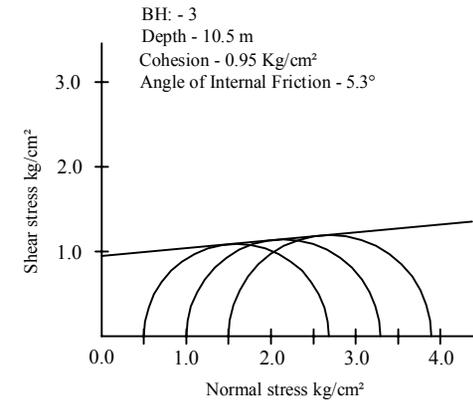
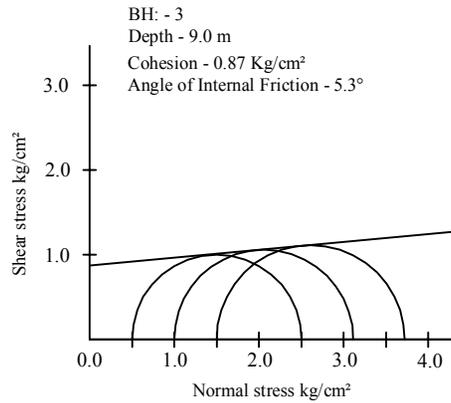
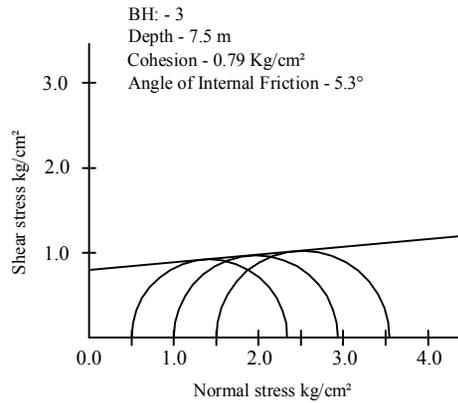
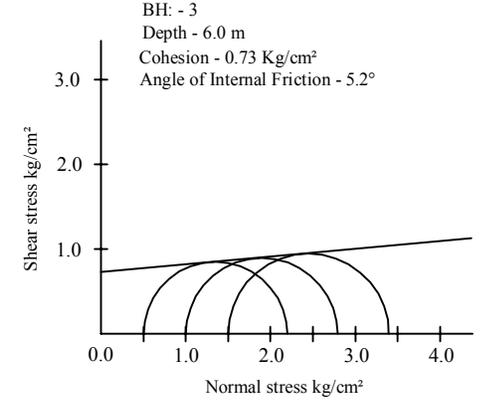
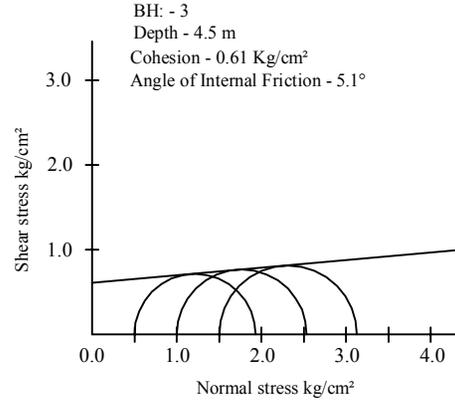
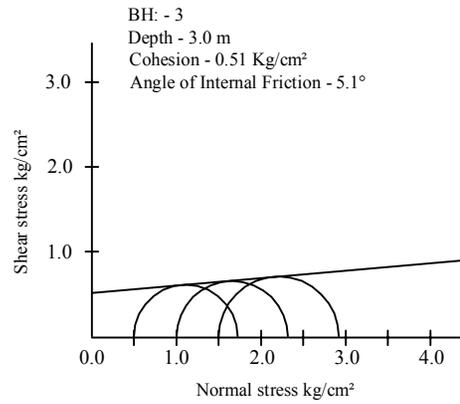
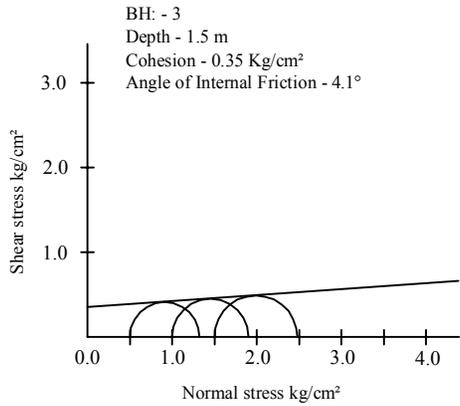
# TRIAXIAL / DIRECT SHEAR TEST PLOTS



# TRIAXIAL / DIRECT SHEAR TEST PLOTS



# TRIAXIAL / DIRECT SHEAR TEST PLOTS

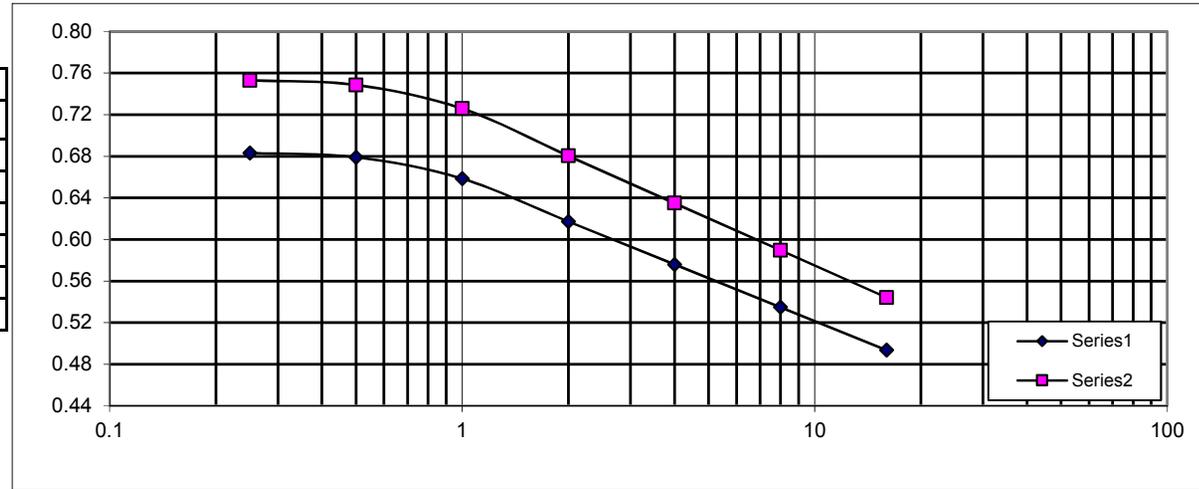


Report on SubSoil Investigations for the proposed  
Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur

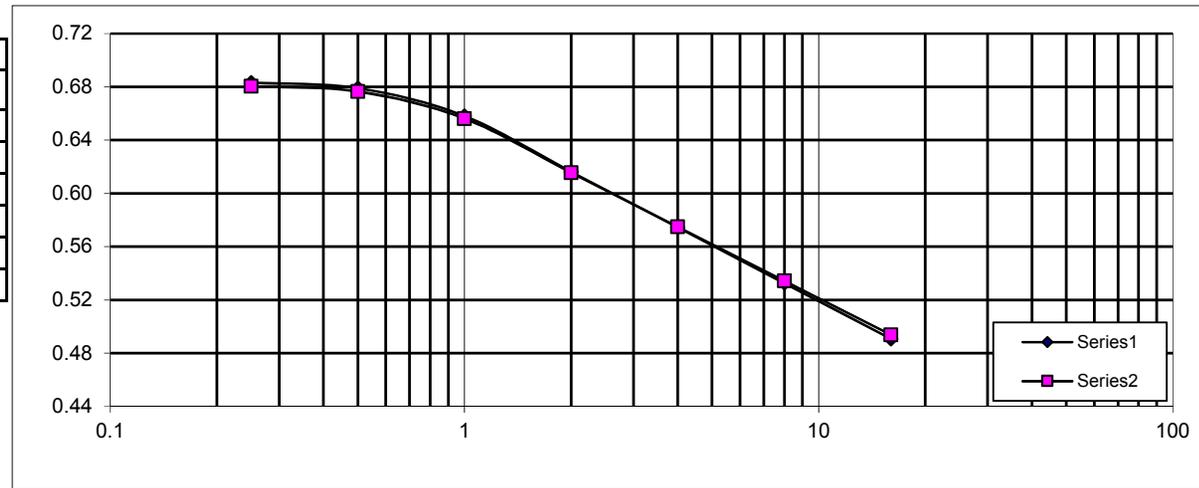
**Fig. e - log p Plots from Consolidation Tests**

**X-axis :** Pressure, p (kg/cm<sup>2</sup>) on log scale.      **Y-axis :** Void ratio, e

BH No./	Initial V.R.		
Depth (m)	C <sub>c</sub>	e <sub>0</sub>	CURVE
1/4.5	0.137	0.6858	Series1
2/3.0	0.151	0.7560	Series2



BH No./	Initial V.R.		
Depth (m)	C <sub>c</sub>	e <sub>0</sub>	CURVE
2/4.5	0.139	0.6858	Series1
3/4.5	0.135	0.6831	Series2



## Report on Sub Soil Investigations for the proposed Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur

### SAMPLE CALCULATION OF BEARING CAPACITY OF SHALLOW FOUNDATION

The determination of the **net safe bearing capacity**,  $q_{ns}$ , is done on the basis of the shear failure criterion after dividing the value of the **net ultimate bearing capacity**  $q_{nf}$ , calculated as described below, by a suitable factor of safety. The **net soil pressure**,  $q_s$ , for a given permissible settlement is then calculated as explained in the next section. The lower of the two values,  $q_{ns}$  and  $q_s$ , thus determined is taken as the **allowable bearing capacity** of the soil.

#### 1. Shear Failure Criterion :

The **net ultimate bearing capacity**  $q_{nf}$  ( $t/m^2$ ) of a shallow foundation of breadth B (m) and depth D (m) is given as per IS:6403-1981 (Sec.5.1.2) by the following equation :

$$q_{nf} = c N_c s_c d_c I_c + q (N_q - 1) s_q d_q I_q + 0.5 \gamma B N_\gamma s_\gamma d_\gamma I_\gamma w$$

where  $c$  = cohesion ( $t/m^2$ )  
 $\gamma$  = unit weight of subsoil ( $t/m^3$ ) [submerged unit weight,  $\gamma'$ , is taken where so applicable]  
 $q$  = effective surcharge ( $t/m^2$ ) =  $\gamma D$   
 $N_c, N_\gamma, N_q$  = bearing capacity factors, which are functions of  $\phi$ , the angle of internal friction of the soil.  
 $s_c, s_q, s_\gamma$  = shape factors  
 $d_c, d_q, d_\gamma$  = depth factors  
 $I_c, I_q, I_\gamma$  = inclination factors  
 $w$  = water table factor (= 0.5 to 1.0) depending on the depth,  $D_w$  of water table [vide Table below].

} related to cohesion, surcharge and density of subsoil respectively

The bearing capacity factors (N's) are functions of  $\phi$ , the angle of internal friction of the soil. The values of these factors are found for general shear failure by referring to standard tables. If subsoil conditions are such as to lead to local shear failure, the values of these factors are found for a reduced value of angle of internal friction ( $\phi'$ ) given by the equation :  $\tan \phi' = 0.67 \tan \phi$ . The value of cohesion is also reduced to  $c' = 0.67 c$ .

The values of the other factors in the above equation for usual conditions are as tabulated below :

$s_c =$	1.3	1+0.2B/L	1	$d_c =$	1 + 0.2 (N $\phi$ ) <sup>0.5</sup> D/ B	$D_w$ at	G.L.	Fou'dn.Level
$s_q =$	1.2	1+0.2B/L	1	$d_q = d_\gamma =$	1	$w =$	0.5	1
$s_\gamma =$	0.8/0.6	1-0.4B/L	1	$d_q = d_\gamma =$	1 + 0.1(N $\phi$ ) <sup>0.5</sup> D/ B			
FOR	$s_q // O$	Rect.	STRIP	$I_c, I_q, I_\gamma =$	1 for vertical load		Interpolation	between
							these values	is linear.

In the present case, the representative values of cohesion  $c$  and angle of internal friction ( $\phi$ ) may be obtained from the soil data given earlier. Full submergence of the soil has been assumed. The **safe bearing capacity**,  $q_{ns}$  has been obtained by dividing  $q_{nf}$  by a **safety factor, 3**.

One example of calculation of safe bearing capacity for a certain shape, depth and width of a footing is given in **Table A** on the next page. The net safe bearing capacity for the footing is entered in the last column of Table A. Calculations for other depths and widths of footings are done similarly.

The value of net safe bearing capacity ( $q_{ns}$ ) calculated for each set of values of B and D is used for calculating the consolidation settlement  $s$  as explained in Sec. 2 below.

#### 2. Settlement Criterion for Foundation on cohesive soil.

As per IS:8009(Part I)-1976, Sec. 9.2.2.2, the settlement  $s$  (in mm) is given by the equation :

$$s = [1000 H C_c \log (1 + \Delta p / p_o)] / (1 + e_o) \lambda$$

where  $H$  = thickness (in m) of the compressible layer  
 $C_c$  = compression index of the soil  
 $e_o$  = initial void ratio at mid-height of compressible soil layer = its  $m/c$  (m) x sp. Gravity  
 $p_o$  = initial effective pressure at mid-height of the layer ( $t/m^2$ )  
 $\Delta p$  = pressure increment at the mid-height of the layer due to the foundation ( $t/m^2$ ).  
 $\lambda$  = correction factor

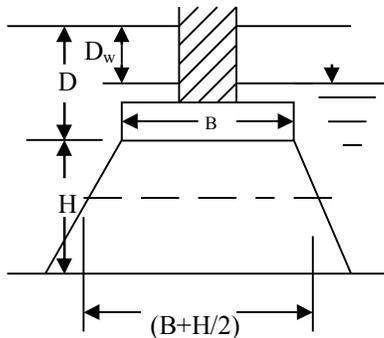
## Report on Sub Soil Investigations for the proposed Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur

If there are different layers with different compression indices and void ratios,  $s$  is calculated for each one of these and then added together to get the settlement.

The pressure increment at any plane due to the footing load may be calculated by assuming the dispersion of load at a slope of 1 horizontal to 2 vertical. Hence the load applied over a width  $B$  of a foundation (vide the Fig. below) is spread at a depth  $H/2$  below it over a width  $(B + H/2)$ .

A correction factor  $\lambda = 0.80$  is used as per IS Code to find the corrected settlement. If this value of corrected  $s$  is within the permissible limit specified in the Code, the corresponding value of  $q_{ns}$  is also the net allowable bearing capacity  $q_{na}$ . If not, trials give the desired value of  $q_{na}$ . One example of this settlement analysis is given below the **Table B** in Sec. 3.

$$\text{If } D_w > (D + 1.5 B/2), p_o = \gamma (D + 1.5 B/2) \text{ t/m}^2, \text{ otherwise, } p_o = \gamma D_w + (\gamma - 1) (D - D_w + H/2) \text{ t/m}^2$$



$D_w$  = depth of water table below ground level .

$D$  = depth of foundation

$B$  = breadth of foundation

$H = 1.5 \times B$  = thickness of compressible soil layer in the zone of influence of the loaded foundation.

Breadth of the influence zone at the mid-plane of the compressible layer, of thickness  $H = (B + H/2)$ .

In case of a rectangular or square footing a similar dispersion of load takes place along the other side of footing.

### 3. SAMPLE CALCULATION

**Table A Calculation of Net Safe Bearing Capacity**

Shape of Foundation:		F.S.=	$\gamma, \text{ t/m}^3 =$		$c =$	$\phi =$	$N_c =$	$N_q =$	$N_y =$
STRIP		3	1.95		2.5	3.1	5.93	1.32	0.25
D [m]	B [m]	dc	dq = dg	c	q	I Term	II Term	III Term	qnf /F
1.5	2	1.16	1	2.5	1.463	17.17	0.47	0.24	17.88
									5.96

The net safe bearing capacity for the footing is to be seen in the last column of the above Table A. This value is checked for settlement as shown below.

**Table B Calculation of Settlement**

m = 0.293		$G_s = 2.7$		eo = 0.7911		Cc = 0.145		Dw = 0	
Depth	Width	qnf /F	po	H	$\Delta p$	$\log (1 + \Delta p / po)$	s [mm]	$\lambda s$ mm	Remarks
D [m]	B [m]	t/m <sup>2</sup>	t/m <sup>2</sup>	m	t/m <sup>2</sup>		mm	mm	
1.5	2.0	6.0	2.9	3.0	3.4	0.3	82.9	66.3	OK

Hence the **net allowable bearing pressure** for a strip footing of width 2.0 m and depth 1.5 m below ground level will be 6.0 t/m<sup>2</sup>.

The calculations for footings of other sizes and depths are done similarly

Calculations of Capacity of U/R Pile for the proposed  
Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur

U/R	<u>Pile Capacity Calculation</u>				L	D, stem	Du	No. of bulbs, n=	Qs		
	Qu =	Ap Nc cp + AaNc c'a +	[0.5]As ca + A's.ca'		4.0	0.25	0.50	1	4.6		
where	Ap =	area of base of pile =	pi D <sup>2</sup> /4		4.0	0.25	0.50	2	5.6		
	Aa =	area of annular ring =	pi Du <sup>2</sup> /4 - Ap		6.0	0.25	0.50	1	7.2		
	As =	area of stem =	pi D(L- 1.5 (n-1) Du-0.55-0.5)		6.0	0.25	0.50	2	8.9		
	As' =	area of cyl. bet. bulbs =	pi Du 1.5(n-1) Du		8.0	0.25	0.50	1	10.7		
aver. coh.					8.0	0.25	0.50	2	12.7		
at base, cp		over depth (L-0.55) to (L+ 0.45)			10.0	0.25	0.50	1	13.7		
at bulbs, c'a		over depth (L-0.55- 1.5 Du) to (L-0.55)			10.0	0.25	0.50	2	16.1		
on stem, ca		over depth 0 -(L- 1.5 Du) & (L-0.55) to L									
cyl. Bet. Bulbs, ca'											
		Bulb dia =	2	x shaft dia							
<b>Factor of safety =</b>		<b>2.50</b>									
L	D	Du	No. of bulbs, n=	Ap	Aa	As	As'	cp	c'a	ca	ca'
m	m	m		m <sup>2</sup>	m <sup>2</sup>	m <sup>2</sup>	m <sup>2</sup>	t/m <sup>2</sup>	t/m <sup>2</sup>	t/m <sup>2</sup>	t/m <sup>2</sup>
4.0	0.25	0.50	1	0.05	0.15	2.32	0.00	4.50	4.50	3.00	
4.0	0.25	0.50	2	0.05	0.15	1.73	1.18	4.50	4.50	3.00	3.00
6.0	0.25	0.50	1	0.05	0.15	3.89	0.00	6.10	6.10	3.70	
6.0	0.25	0.50	2	0.05	0.15	3.30	1.18	6.10	6.10	3.70	4.50
8.0	0.25	0.50	1	0.05	0.15	5.46	0.00	7.50	7.50	4.94	
8.0	0.25	0.50	2	0.05	0.15	4.87	1.18	7.50	7.50	4.94	5.40
10.0	0.25	0.50	1	0.05	0.15	7.03	0.00	8.60	8.60	5.40	
10.0	0.25	0.50	2	0.05	0.15	6.44	1.18	8.60	8.60	5.40	6.40
L	D	Du	No. of bulbs, n=	ApNc cp	AaNc ca'	[0.5]As ca	As' ca'	Qu	Qs		
m	m	m		t	t	t	t	t	t		
4.0	0.25	0.50	1	1.99	5.96	3.48	0.00	11.43	4.6		
4.0	0.25	0.50	2	1.99	5.96	2.59	3.53	14.08	5.6		
6.0	0.25	0.50	1	2.69	8.08	7.19	0.00	17.97	7.2		
6.0	0.25	0.50	2	2.69	8.08	6.10	5.30	22.18	8.9		
8.0	0.25	0.50	1	3.31	9.94	13.48	0.00	26.74	10.7		
8.0	0.25	0.50	2	3.31	9.94	12.03	6.36	31.64	12.7		
10.0	0.25	0.50	1	3.80	11.40	18.98	0.00	34.18	13.7		
10.0	0.25	0.50	2	3.80	11.40	17.39	7.54	40.13	16.1		

Bihar Foundation Consultants.

403, Ganga Darshan Apartment, Patna -10.

[A unit of Baidyanath Foundation Consultants Pvt. Ltd.]

# Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur



बिहार राज्य शैक्षणिक आधारभूत संरचना विकास निगम लिमिटेड  
BIHAR STATE EDUCATIONAL INFRASTRUCTURE DEVELOPMENT CORPORATION LTD.

(A Govt. of Bihar Undertaking)  
ISO 9001:14001; OHSAS 18001

Shiksha Bhawan, Bihar Rashtrabhasha Parishad Campus, Acharya Shivpujan Sahay Path, Saidpur, Patna - 800 004

Tel. No. : 0612 - 2660850 • Fax No. : 0612 - 2660256

E-mail : bseidc@gmail.com • Website : http://www.bseidc.in • CIN : U80301BR2010SGC015859

पत्रांक:- BSEIDC/TECH/1960/2018 - 7919

दिनांक 22/11/2021

प्रेषक,

मुख्य अभियंता  
BSEIDC Ltd, Patna

सेवा में,

बिहार फाउंडेशन कंसल्टेन्ट  
गंगा दर्शन अपार्टमेंट, फ्लैट नं०-403,  
सदाकत आश्रम के पश्चिम,  
पटना- 800010

विषय:- निर्माण स्थल के मिट्टी जाँच हेतु।

प्रसंग:- भवन निर्माण विभाग का पत्र संख्या-2030, दिनांक-21.04.2006

महाशय,

बिहार राज्य शैक्षणिक आधारभूत संरचना विकास निगम लि० के अधीन " औरंगाबाद, मुजफ्फरपुर, बांका, गया एवं नवादा " में आवासीय छात्रावास का निर्माण कार्य प्रस्तावित है। इस भवन के निर्माण स्थल पर मिट्टी की जाँच कराना है।

अतः अनुरोध है कि उपरोक्त स्थल का तीन बिन्दुओं पर 10.5 मीटर गहराई तक प्रत्येक 1.5 मीटर गहराई में मिट्टी का नमूना संग्रह कर प्रतिवेदन समर्पित करें। साथ ही विहित प्रपत्र में मिट्टी के भार वहन क्षमता की गणना (Isolated एवं Pile Foundation के लिए अलग-अलग) भी Hard Copy एवं Soft Copy में समर्पित करें।

इस जाँच कार्य को इस तरह संपादित करें कि ट्रान्सपोर्टेशन एवं मोबलाईजेशन खर्च कम से कम हो। कार्य स्थल पर सम्पर्क व्यक्ति, कार्य से संबंधित प्राचार्य/ संबंधित कार्यपालक अभियंता रहेंगे।

विश्वासभाजन

मुख्य अभियंता

Bihar Foundation Consultants  
403, Ganga Darshan Apartment, Patna-10  
[A Unit : Baidyanath Foundation Consultants Pvt. Ltd.]

PN - 211209

Appendix - G1

# Government Higher Secondary School at Block- Sahibganj, Dist. Muzaffarpur

32

नेताजी सुभाष चन्द्र बोस आवासीय छात्रावास निर्माण हेतु प्रस्तावित विद्यालयों के नाम एवं भूमि की विवरणी:

क्रमांक	जिला का नाम	प्रखंड का नाम	आवासीय छात्रावास से संबंधित विद्यालय का नाम	उपलब्ध भूमि की विवरणी (खाता सं०, खेसरा एवं रकबा सहित)
1	औरंगाबाद	नवीनगर	उच्च माध्यमिक विद्यालय, बेला	खाता सं०- 71, 132 प्लॉट न० 370, 369, 366, 1028 एराजी - 01 एकड़ 80 डिसमिल थाना सं०- 192, तौजी- 2802
2	मुजफ्फरपुर	साहेबगंज	राजकीयकृत उच्चतर म० वि० साहेबगंज	खाता सं०- पुराना- 56 खेसरा - पुराना- 1333, 1334 खाता सं०- नया- 494 खेसरा सं०- नया - 1520, 1521 रकबा - 06 एकड़ 50 डिसमिल लगभग।
3	बांका	बांका	प्र० म० वि० चक्काडीह	खाता- 153, 449 खेसरा - 508, 614 रकबा - 01 एकड़ 11 डिसमिल
4	गया	मोहनपुर	म० वि० जेठुआ डाहा	रकबा - 3 एकड़ 64 डिसमिल
5	नवादा	रजौली	म० वि० चिरैला	खाता (नया) - 58 प्लॉट- 651, 652 पुराना- 98, प्लॉट- 725, 726, 732, 733 एवं 734 रकबा- 3 एकड़ 36 डिसमिल

*Account  
21/09/2021  
EE, SLO.*

Bihar Foundation Consultants  
403, Ganga Darshan Apartment, Patna-10  
[A Unit : Baidyanath Foundation Consultants Pvt. Ltd.]